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PATENT SPECIFICATION

619,485

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Complete Specification Accepted: March 10, 1949.

Index at acceptance:—Class 35, A2ex, E2m.

COMPLETE SPECIFICATION

Improvements in Dynamo-Electric Machines

Communicated by The General Electric Company, (a Corporation organised under the laws of the State of New York, United States of America), of Schenectady, County of Schenectudy, State of New York, United States of America.

We, The British Thomson-Houston Company Limited, a British Company having its registered office at Crown House, Aldwych, London, W.C.2, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to a dynamo-electric machine of the type wherein the laminated ferromagnetic core and the winding of the stator are protected by a common enclosure and aims at enabling heavier loads than customary to be carried by the machine through the provision of special means for a rapid transfer to the surface of the enclosure of heat which is generated by the iron losses in the stator.

The invention resides in that a dynamo-electric machine having a laminated ferromagnetic stator core is provided with a common enclosure for the said core and the stator winding, which enclosure comprises a cylindrical wall of thin metal, e.g. sheet metal, disposed between the stator core and the rotor of the machine, and with metal fins extending from the said cylindrical wall into the said core to contact the laminations and to establish a heat transfer from the laminations to the cylindrical wall.

The position of the fins can be transverse, i.e. at right angles to the axis of the machine, or longitudinal, i.e. parallel to the axis of the machine, and longitudinal fins which can be formed by intermediary members can be arranged to engage with their outer ends winding retaining elements in the stator slots.

More features will be seen and the invention will be better understood from the following description referring to the accompanying drawing, in which Fig. 1 is an elevational view, partly in section, of a portion of a dynamo-electric machine embodying the invention, Fig. 2 is a sectional view taken along line 2—2 of Fig. 1 showing a part of the stator of the machine; Fig. 3 is a partial side elevational view in section similar to Fig. 1 of another embodiment of the invention; Fig. 4 is an end view partly broken away, showing another embodiment of the invention; Fig. 5 is a sectional side view taken along line 5—5 of Fig. 4, Fig. 6 is a fragmentary view taken along line 6—6 of Fig. 5. Fig. 7 is a sectional partial end view of a further embodiment of the improved dynamo-electric machine construction.

Referring to the drawing, a dynamo-electric machine is shown which is adapted to be used in locations where the medium which surrounds the machine may be injurious to either or both the stator core and winding if it is permitted to come in contact therewith. The machine illustrated is an induction motor provided with a conventional laminated rotor core 10 having a squirrel cage winding 11 therein and supported on a shaft 12. The stationary member of the machine is provided with a core 13 formed of laminations of magnetic material having winding slots 14 formed therein in which a winding 15 is arranged. Insulating retaining elements 16 may be arranged on the outer side of the winding 15 adjacent the opening of the winding slots 14 to hold the winding in position if this is found desirable. The core 13 is mounted in a shell or frame 17 arranged about the outer periphery of the laminations and is held in position in the frame 17 by a pair of retaining end rings 18 arranged in engagement with the outer laminations of the core and secured to the frame 17 in

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any suitable manner, as by welding. The laminations of th core 13 and the winding 15 are arranged within an enclosure which includes end plates 19 secured to the stator frame or shell 17 and provided with a relatively thin tubular member 20, preferably of material having a relatively high resistance, which extends between the end plates 19 and is secured thereto in any suitable manner to form a fluid-tight joint therewith, so that the laminations and the winding 15 are enclosed in a substantially fluid-tight housing. The tubular member 20 is formed with a plurality of axially spaced apart outwardly and circumferentially extending, i.e. transverse projections or fins 21 in the form of integral corrugations which extend outwardly from the outer side of the tubular member into grooves or slots in the core 13 between certain of the laminations and may be made to extend substantially into engagement with the outer surface of the winding retaining elements 16 if desired, so as to provide for a ready transfer of heat between the tubular member 20 and the laminations of the core and to stiffen and strengthen the member 20.

Fig. 3 shows a modification of the arrangement shown in Figs. 1 and 2 in which the dynamo-electric machine may be provided with any suitable rotatable member similar to the rotor shown in Fig. 1. The general construction of the stationary member in this embodiment of the invention is the same as that shown in Figs. 1 and 2, except that the axially spaced apart projections formed on the tubular member 20 are in the form of circumferential rings 22 contacting the member 20 and preferably integrally joined thereto, as by welding or brazing, to insure a good thermal heat transfer connection therewith. As in the arrangement shown in Fig. 1, these rings extend outwardly from the outer side of the tubular member 20 into grooves or slots in the core 13 between certain of the laminations to provide for stiffening of the tubular member. These elements also are securely held between certain of the laminations to provide for transferring heat between the member 20 and the laminations of the core 13.

It will be understood that longitudinal fins lying in planes which are parallel to the axis of the machine, can be used to contact both the laminæ of the core and the wall of the enclosure, instead of or in addition to the fins which are positioned at right angles to the axis of the machine as described with reference to Figs. 1 and 2 or 3.

Figs. 4, 5 and 6 refer to another embodiment of the invention. The same general construction of the stator and fins as shown in Figs. 1 and 2 or 3 is provided and in addition to th fins which engage the laminæ of the core (and which are not shown in these Figures) projections of the inner shell are formed as longitudinally or axially extending circumferentially spaced apart corrugations 23 on the outer side of a substantially cylindrical thin tubular member 20 of suitable material, such as an electrically high resistance metal. The corrugations 23 are formed with slightly larger outer portions than the inner portions near the tubular member 20 and extend outwardly into the narrow open ends of the winding slots 14 in the core and in the illustrated construction extend into contact with slot insulation 24 about the winding 15. This provides for retaining the winding and slot insulation in position and assures locking the tubular member 20 securely to the core 13 and in good thermal contact with the ends of teeth 25 to provide for good interchange of heat therebetween. The outer end portions 26 of the corrugations 23 are shown folded and closed together as by pressing and secured together and to end plates 19 by a fluid tight seal in any suitable manner, as by welding, or brazing. These ends 26 may be secured directly to the end plate as to a flange 27 thereof or to a thin cylinder 28 secured to the end plate 19 to form a fluid tight enclosure with the shell 17 about the winding 15 and the core 13. This construction provides a compact and reinforced air-gap enclosure.

Fig. 7 illustrates a still further variation of the invention, wherein the additional projections are formed as ribs 29 welded, brazed, or otherwise suitably secured to an inner tubular or cylindrical member 20. These ribs 29 extend within the outer open ends of winding slots 14 in the core 13 and into good thermal contact with the adjacent ends of the teeth 25. The ends of the enclosing tubular member 20 are secured to the shell end plates 19 by suitable fluid tight joints such as those shown in Fig. 5 and provide substantially the same advantages of that construction which is made of simple structural elements. The projecting ribs 29 might also be made with larger and tapered wedge-shaped outer portions to lock the inner member 20 to the core 13 as in Fig. 4.

While we have illustrated and described particular embodiments of the invention, modifications thereof will occur to those skilled in the art which may be made without departing from the scope of the invention:—

Having now particularly described and ascertained the nature of our said inven-

tion and in what manner the same is to be performed, we declare that what we claim is:—

1. A dynamo electric machine having a laminated ferromagnetic stator core and a common enclosure for the core and the stator winding, which enclosure comprises a cylindrical wall of thin metal, e.g. sheet metal, disposed between the stator core and the rotor of the machine and provided with metal fins extending from the said cylindrical wall into the said core to contact the ferromagnetic laminations and to establish a heat transfer means between them and the cylindrical wall.

2. A machine according to claim 1 wherein the fins are formed by corrugations or folds of the cylindrical wall.

3. A machine according to claim 1 wherein the fins are soldered, brazed or welded to the cylindrical wall.

4. A machine according to any of the preceding claims wherein the fins are positioned transversely, i.e. at right angles to the axis of the machine.

5. A machine according to any of the claims 1 to 3 wherein the fins are positioned longitudinally, i.e. parallel to the axis of the machine.

6. A machine according to claims 4 and 5 comprising both transverse and longitudinal fins, which latter fins can be integral with the cylindrical wall or formed by intermediary members.

7. A machine according to claim 5 or 6 wherein the outer ends of the longitudinal fins engage the winding retaining elements in the stator slots.

8. A machine according to any of the preceding claims, wherein portions of the wall of the enclosure are joined together in a fluid tight manner, e.g. by welding.

9. A dynamo-electric machine substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

Dated this 24th day of February, 1944.

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Agent for the Applicants.

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FIG.1.

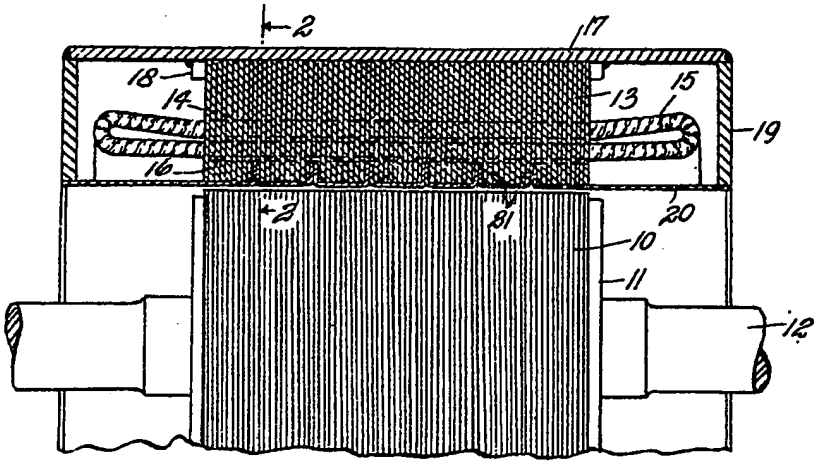

FIG.2.

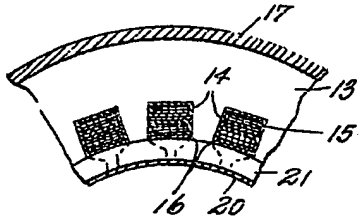

FIG.3.

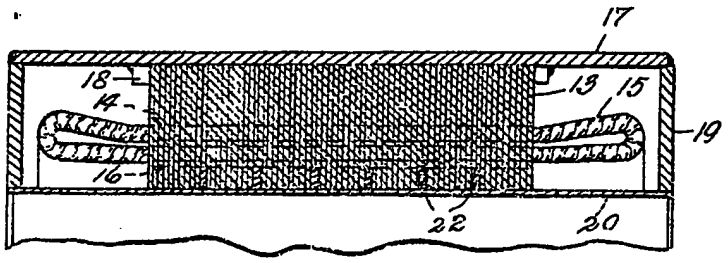

FIG.4.

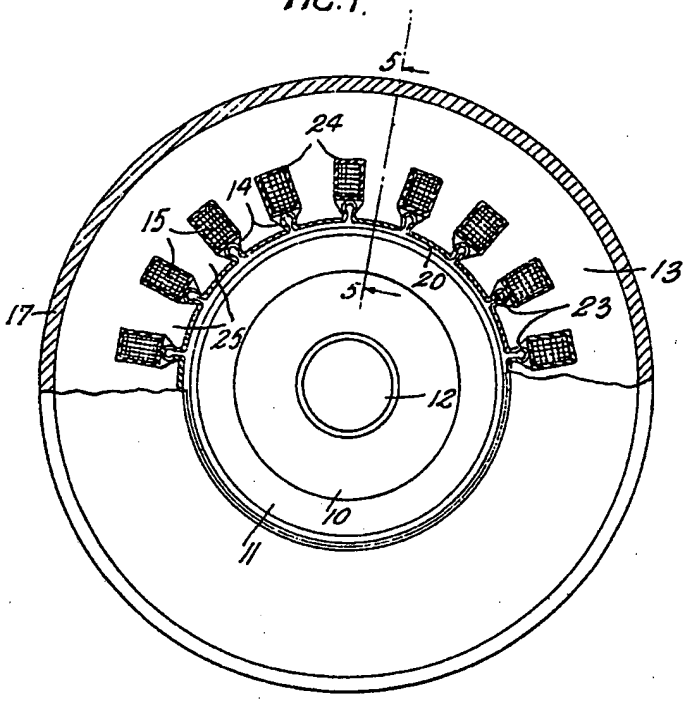

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FIG.5.

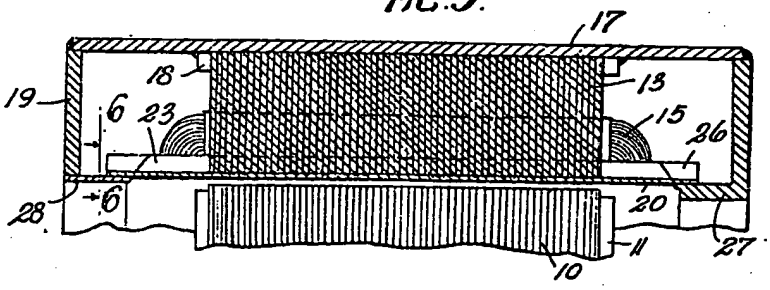
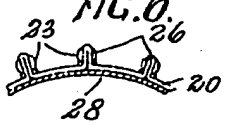


FIG.6.



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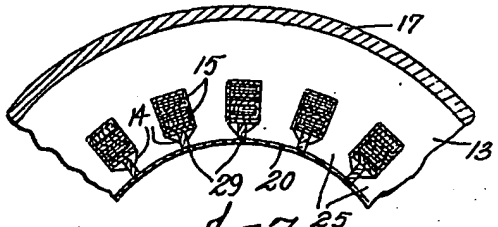


FIG.7.

619,485 COMPLETE SPECIFICATION

2 SHEETS

SHEET 1

SHEET 2

[This Drawing is a reproduction of the Original on a reduced scale.]

FIG.1.

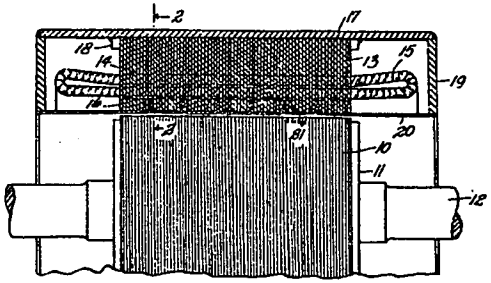


FIG.2.

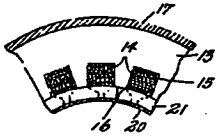


FIG.3.

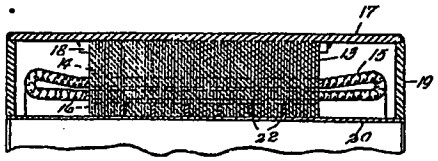


FIG.4.

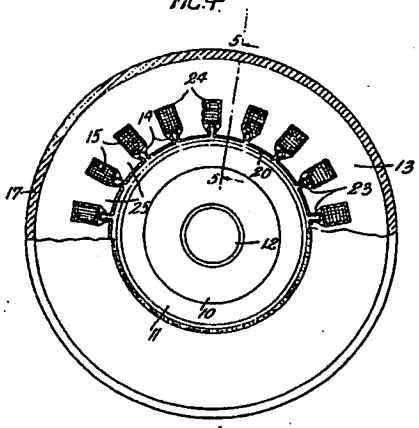


FIG.5.

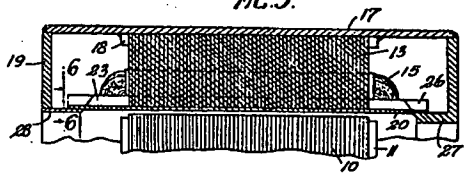
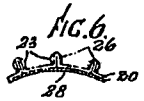


FIG.6.



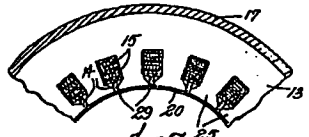


FIG.7.

H.M.S.O.(Ty.P.)